WHAT IS CLAIMED IS:

1. A multicarrier transmitter for performing data transmission by way of digital multicarrier modulation using a real coefficient wavelet filter bank, said multicarrier transmitter comprises:

a signal point mapping unit for performing symbol mapping of a series of information;

a serial-to-parallel converter for converting serial data as said symbol mapped series of information to parallel data;

a first inverse wavelet transformer including a plurality of real coefficient wavelet filters orthogonal to each other, said first inverse wavelet transformer performing a first inverse wavelet transform on said parallel data;

a second inverse wavelet transformer including: real coefficient wavelet filters of said first inverse wavelet transformer where Hilbert transform has been made, with the sign of the odd-numbered real coefficient wavelet filters inverted, said second inverse wavelet transformer performing a second inverse wavelet transform on said parallel data; and

a modulator for performing SSB modulation by using the output from said first inverse wavelet transformer as an in-phase signal of complex information and the output from the second inverse wavelet transformer as an orthogonal signal of complex information.

2. The multicarrier transmitter according to claim 1, wherein said first inverse wavelet transformer comprises:

a high-speed discrete cosine transformer for inputting parallel data from the serial-to-parallel converter;

a first prototype filter including a polyphase filter having a real coefficient, said first prototype filter inputting output data of said high-speed discrete cosine transformer;

M upsamplers for inputting output data of said first prototype filter; and

M-1 single sample delay elements for inputting output data of said upsamplers.

3. The multicarrier transmitter according to claim 1, wherein said second inverse wavelet transformer comprises:

a high-speed discrete sine transformer for inputting parallel data from said serial-to-parallel converter;

a second prototype filter including a polyphase filter having a real coefficient, said second prototype filter inputting output data of said high-speed discrete sine transformer;

M upsamplers for inputting output data of said second prototype filter; and

M-1 single sample delay elements for inputting output data of said upsamplers.

4. The multicarrier transmitter according to claim 1,

wherein said first inverse wavelet transformer comprises:

a high-speed discrete cosine transformer for inputting parallel data from the serial-to-parallel converter;

a first prototype filter including a polyphase filter having a real coefficient, said first prototype filter inputting output data of said high-speed discrete cosine transformer;

M upsamplers for inputting output data of said first prototype filter; and

M-1 single sample delay elements for inputting output data of said upsamplers; and

said second inverse wavelet transformer comprises:

a high-speed discrete sine transformer for inputting parallel data from said serial-to-parallel converter;

a second prototype filter including a polyphase filter having a real coefficient, said second prototype filter inputting output data of said high-speed discrete sine transformer;

M upsamplers for inputting output data of said second prototype filter; and

M-1 single sample delay elements for inputting output data of said upsamplers.

5. A multicarrier receiver for performing data reception by way of digital multicarrier demodulation using a real coefficient wavelet filter bank, said multicarrier receiver comprises:

a first multiplier and a second multiplier for downconverting a received bandpass signal to a baseband signal;

a local oscillator for providing said first multiplier with a signal of a predetermined frequency;

a $\pi/2$ phase shifter for delaying the phase of said local oscillator by $\pi/2$ to generate a carrier orthogonal to said second multiplier;

a first LPF and a second LPF for removing an unwanted signal outside the band of a baseband signal output from each of said first and said second multipliers;

a first wavelet transformer for performing wavelet transform on an in-phase signal and an orthogonal signal output from each of said first LPF and said second LPF;

an equalizer for equalizing each parallel signal of an in-phase signal and an orthogonal signal output from said first wavelet transformer as a complex signal of each subcarrier;

a parallel-to-serial converter for converting a parallel signal output from said equalizer to a serial signal; and

a determination unit for determining serial data output from said parallel-to-serial converter.

6. The multicarrier receiver according to claim 5, wherein said first wavelet transformer comprises:

M-1 single sample delay elements for inputting an in-phase signal and an orthogonal signal output from said first LPF and

said second LPF;

M upsamplers for inputting output data of said single sample delay elements;

a first prototype filter for inputting output data of said M upsamplers; and

a high-speed discrete cosine transformer for inputting output data of said first prototype filter.

7. A multicarrier receiver for performing data reception by way of digital multicarrier demodulation using a real coefficient wavelet filter bank, said multicarrier receiver comprises:

a multiplier for downconverting a received bandpass signal to a baseband signal;

a local oscillator for providing said multiplier with a signal of a predetermined frequency;

an LPF for removing an unwanted signal outside the band of baseband signal output from said multiplier;

a first wavelet transformer for performing a first wavelet transform on an output signal from said LPF;

a second wavelet transformer for performing Hilbert transform on the real coefficient wavelet filters of said first wavelet transformer, said second wavelet transformer including said real coefficient wavelet filters of the first wavelet transformer where Hilbert transform has been made, with the sign

of said odd-numbered real coefficient wavelet filters inverted, said second wavelet transformer performing a second wavelet transform on an output signal from said LPF;

an equalizer for equalizing each parallel signal of an in-phase signal output from said first wavelet transformer and an orthogonal signal output from said second wavelet transformer as a complex signal of each subcarrier;

a parallel-to-serial converter for converting an equalized parallel signal output from said equalizer to serial data; and

a determination unit for determining serial data output from said parallel-to-serial converter.

8. The multicarrier receiver according to claim 7, wherein said first wavelet transformer comprises:

M-1 single sample delay elements for inputting an output signal of said LPF;

M upsamplers for inputting output data of said single sample delay elements;

a first prototype filter for inputting output data of said M upsamplers; and

a high-speed discrete cosine transformer for inputting output data of said first prototype filter.

9. The multicarrier receiver according to claim 7,

wherein said second wavelet transformer comprises:

M-1 single sample delay elements for inputting an output signal of said LPF;

M upsamplers for inputting output data of said single sample delay elements;

a second prototype filter for inputting output data of said M upsamplers; and

a high-speed discrete sine transformer for inputting output data of said second prototype filter.

10. The multicarrier receiver according to claim 7, wherein said first wavelet transformer comprises:

M-1 single sample delay elements for inputting an output signal of said LPF;

M upsamplers for inputting output data of said single sample delay elements;

a first prototype filter for inputting output data of said M upsamplers; and

a high-speed discrete cosine transformer for inputting output data of said first prototype filter; and

said second wavelet transformer comprises:

M-1 single sample delay elements for inputting an output signal of said LPF;

M upsamplers for inputting output data of said single sample delay elements;

a second prototype filter for inputting output data of said M upsamplers; and

a high-speed discrete sine transformer for inputting output data of said second prototype filter.

11. Multicarrier communications apparatus comprising a multicarrier transmitter and a multicarrier receiver, said multicarrier communications apparatus performing data transmission by way of digital multicarrier modulation/demodulation using a real coefficient wavelet filter bank including M real coefficient wavelet filters (M being a positive integer),

said multicarrier communications transmitter comprising:

a signal point mapping unit for converting bit data to symbol data to map said symbol data on M/2 complex coordinate planes;

a serial-to-parallel converter for converting serial data as said mapped symbol data to parallel data;

a complex data decomposer for inputting said parallel data as well as decomposing complex data into a real part and an imaginary part so as to supply an in-phase component of complex information to the (2n-1)th input to said first and said second inverse wavelet transformers and supply an orthogonal component to the 2nth input (where $1 \leqq n \leqq (M/2-1)$, a subcarrier number is 0 to M-1);

a first inverse wavelet transformer comprising said M real coefficient wavelet filters orthogonal to each other, said first inverse wavelet transformer outputting an in-phase signal of said complex data;

a second inverse wavelet transformer comprising said M real coefficient wavelet filters orthogonal to each other, said second inverse wavelet transformer outputting an orthogonal signal of said complex data; and

an SSB modulator for performing SSB modulation by using the output from said first inverse wavelet transformer as an in-phase signal of complex information and the output from said second inverse wavelet transformer as an orthogonal signal of complex information; and

wherein a detector of said multicarrier receiver comprises:

a multiplier for downconverting a received bandpass signal as a receive signal of a received bandpass signal to a baseband signal;

a local oscillator for providing said multiplier with a signal of a predetermined frequency;

an LPF for removing an unwanted signal outside the band of a baseband signal output from said multiplier;

a first wavelet transformer comprising M real coefficient wavelet filters orthogonal to each other, said first wavelet transformer inputting the output data from said LPF; and

a complex data generator for generating complex data by using the (2n-1)th output from said first wavelet transformer as an in-phase component of complex information and 2nth output as an orthogonal component (where $1 \leqq n \leqq (M/2-1)$, a subcarrier number is 0 to M-1).

12. Multicarrier communications apparatus comprising a multicarrier transmitter and a multicarrier receiver, said multicarrier communications apparatus performing data transmission by way of digital multicarrier modulation/demodulation using a real coefficient wavelet filter bank including M real coefficient wavelet filters (M being a positive integer),

said multicarrier communications transmitter comprising:

a synchronization data generator for generating a signal as data known to said multicarrier receiver and the multicarrier transmitter according to claim 11 as a modulator for inputting said signal as know data from said synchronization data generator; and

said multicarrier receiver comprising:

the detector according to claim 11 for outputting adjacent complex subcarrier data including a subcarrier pair and a synchronization estimation circuit for estimating a symbol synchronization timing from the difference between said adjacent complex subcarrier data items.